

VARIATIONS IN AN AUSTRALIAN HALIOTID, *HALIOTIS COCCORADIATA* Reeve, 1846

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For a number of years malacologists have commented on the variation in the sculpture and colouration of *Haliotis coccoradiata* Reeve, 1846, inhabiting the south-eastern coast of Australia. In this summary the genus *Haliotis* is used in the broadest sense (*sensu lato*), as anatomical evidence suggests that our present classification at the generic level needs revision. Rather than digress into a study of the higher classifications on a study restricted to a single species, the well-known *Haliotis* will be used.

As a number of specimens were available to the writer, from localities that could be plotted on a large scale map, it was thought that perhaps some answer might be found for the variations which had been observed. The following notes are the result of this comparative investigation.

Eighty specimens were made available for examination, as well as those in the collections of the museums and universities on the coast of California. However, the basic study is restricted to the eighty specimens, ranging from 10 mm. to 60 mm. major diameter, eleven of which contained the soft parts for comparison and dissection. The majority of these specimens were taken within a few miles of Sydney, thus presenting a good representation of this population of the species. Series such as these give a much clearer concept of the species, as the age stages, pathological specimens, and colour variations are more readily identified as such. The animal in combination with the shell presents a check on the possible separation at a species level, as well as providing a means of determining if sexual differences cause variation in the shell.

Nearly all the specimens had a similar shape, regardless of age stages, so the shape of the shell was ruled out for comparative purposes.

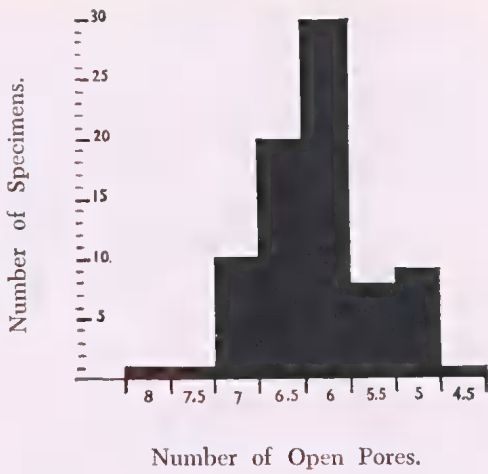
Other than colouration, there were found to be two distinct and notable variables: the number of open siphonal pores (which is given great status by Reeve (1846a); and the sculpture.

Open Siphonal Pores: In the series examined, the number ranged from 4½ to eight, with sixty (75%) of the specimens having 6 to 7 (Text fig. 1). The number of orifices could not be attributed to age stages, as both the smallest and largest specimens had six each. The evidence indicates that the number of such openings is dependent upon the individual animal.

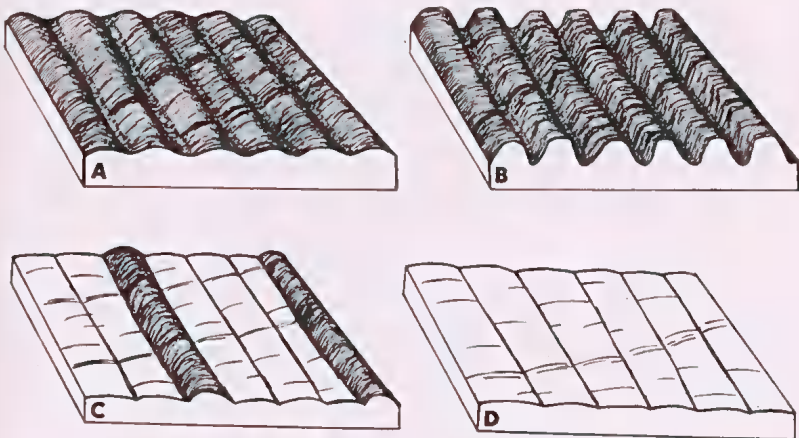
Sculpture: This was found to exhibit considerable variation, which could not be correlated with any age stage. The shell, in most cases, is covered with a series of rather uniform cords, which under a strong glass, give a scale-like appearance. There are low rounded wrinkles, radiating from the suture in the upper third of the body whorl.† The chief variation is in the cording, which may be divided into four types and which merge from one into the other (Text. fig. 2). The most common

†One example was noted to have these wrinkles developed into actual lamellae, but this shell was pathological in other features also.

*Willow Creek, California, U.S.A.



Text fig. 1.



Text fig. 2 (Diagrammatic).
Types of sculpture.

(Text fig. 2 A) was a rather uniform, rounded thread, more or less equally spaced across the shell. This blended into the second type (Text fig. 2 B), which had enlarged and sharply defined cords. These enlarged cords were quite striking, and gave the specimens almost a separate specific appearance. The third type (Text fig. 2 C), a much less common sculpture, consisted of a single, rather coarse cord, widely spaced on a nearly smooth shell surface. Under a glass, obsolete cording could be seen in the semi-smooth areas. The fourth type (Text fig. 2 D) was a nearly smooth surface which gave no indication of wear or erosion, only obsolete striae. These last two types of sculpture, like the coarsely corded form, were quite notable. This was true in the specimens that had the sculpture in the pure form, but the numerous intermediate shells formed a perfect intergradational series.

Colouration: This varies so much that it would be impossible to describe in any detail the numerous phases. As the colour charts of Ridgeway and others are not available to all students, only general terms will be used. It was found that no two specimens were alike. The basic colours were a rich red-brown, white, cream, or light green. These were boldly splotched over the surface of the shell, the radiating markings shown in the original illustrations not being found in many cases. Some specimens, instead of having the bold maculations, had the colouration subdued and blurred into more or less pastel tints. A few specimens were nearly concolour.

The various series were then sorted as to locality in an effort to co-ordinate the colouration, sculpture and number of open pores, to a localized ecological condition. It was found that regardless of the collecting station, these same variations occurred in all series.

The animals were examined to learn if sex, as determined by the colour of the gonad, should be used as a factor to correlate the variations observed in the shell. The answer was negative. From the study of the epipodium, *H. coccoradiata* may be placed into the major groupings of the haliotids. This is separable from the minor anatomical groupings of *H. asinina* Linné, *H. cyclobates* Peron and *H. sanguinea* Hanley; that is, the animal may be contained within the shell, the epipodium forms a nearly continuous fleshy girdle encircling the foot, and has both an upper and lower rim. The thickened area between the rims is processed. No two species are alike in this group, but all have a general similarity.

The data thus indicate that *H. coccoradiata* is a quite variable species in the number of open pores, cording and shell colouration. The animal remains constant. These variations cannot be explained as the result of age stages, sexual or localized ecological conditions. The only remaining cause would be on the individual genetic basis. A similar situation exists in the Canary Islands, where a single species also exhibits similar variations (Talmadge, 1958).

To validate the identification of certain material, selected specimens and some series were sent to the British Museum (Natural History) for comparison with the original material used by Reeve in the Hugh Cuming Collection. The basic and most common specimens matched the named series, while the coarsely corded specimens fit into the type lot of *H. lauta* Reeve, 1846. The original description of this last species placed the range in Western Australia. *H. lauta* Reeve has been placed as a synonym

of *H. semiplicata* Menke, 1843, by some authors. These recent comparisons now leave the status of *H. lauta* open to further study.

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